EXHIBIT D

EXPERT REBUTTAL
Marino Property Fire Loss
The Carriage House
256 WESTFIELD STREET
DEDHAM, MA
DOL: 12/20/2002
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MARCH 23, 2006

Since submitting of our initial origin and cause analysis in July 2005, we have had the opportunity to review various witness depositions and interviews, review an investigative protocol for the examination of certain retained evidence and participate in the examination of that evidence, re-examine all of the retained evidence with other plaintiff's and defense experts, reconstruct the kitchen sink and plumbing arrangement within the sink, and review other plaintiffs' and the defendants' expert reports. This review included a videotape of "demonstrative" testing performed by GAI. We find the various defendant's expert reports/conclusions and the video to be flawed for various reasons. This rebuttal report, coupled with our initial investigative report of this fire incident, provides a detailed explanation of the deficiencies we found. These deficiencies, may also be further addressed in rebuttals by Dr. Thomas Eagar, Lester MacLaughlin and Donald Galler in their respective areas of expertise and as illustrated by Jeff Drake.

It is noteworthy that the defendants' expert reports based conclusions, on the statements provided by key witnesses. We have assessed and compared the statements made by these witnesses to the State Fire Marshal Investigator (i.e., early on in the investigation), to T. J. Klem and Associates (also early in the investigation), during recorded statements to GAI (nearly one year after the incident) and their sworn

depositions (most recently taken). We find these statements, to be inconsistent and at times, conflicting.

We found the demonstrative testing performed by GAI, as witnessed within the videotape, to be seriously flawed. It does not accurately replicate the construction of the kitchen wall within the area of the sink cabinet (contrary to their contention. A portion of the wall about the kitchen sink cabinet was retained as evidence during the on-scene investigative process. Early in our investigative process/analysis, we assigned, for this investigation, the front wall of the Carriage House as "south.") Credible fire tests should be accurate representations of the fire scenario. GAI's wall markup failed to include the PVC drain pipe which was run from the opening in the back of the sink cabinet horizontally through several stud bays to the right (west) of the kitchen sink (behind the dishwasher) and to the floor drain located within a wood cabinet approximately 5' from the sink connection (see Drake's renderings). This 2" PVC waste water pipe created a void (i.e., an air gap) in the wall assembly between the fiberglass batt, thermal insulation and the polyethylene vapor barrier. This gap and the gap created in "notching" the PVC pipe through the wood studs would enable the continued growth, development and spread of the fire within the wall assembly and allow products of combustion to move past the stud bay of origin by these two mechanisms (this fire spread mechanism will be discussed in more detail). Furthermore, GAI did not accurately size the hole in the wall assembly appropriately to replicate the opening in the wall assembly. Additionally, the polyethylene sheet utilized by GAI appears pulled and fastened taut (there are no details of the construction of the assembly nor were there data provided to quantify significant variables of the construction of their wall assembly). Some remains of the vapor barrier were collected along within the retained wall assembly from the fire scene. The remaining vapor barrier was observed to be loose (as compared to GAI's demonstration). This looseness would create yet an another air gap between the

polyethylene and the plywood exterior of the wall assembly and allow for the movement and spread of the fire in this plane as well and creating front and back burning dynamics. Another inconsistency within the GAI testing was their placement of screws fastening the plywood to the 2x4 studs. GAI's screw placement was excessive compared to those determined to be present within the retained wall assembly. The first wood stud bay west of the opening within the cabinet was determined to contain only two screws (one near the top of the plywood and the other adjacent to the bottom). With the plywood fastened in this manner, it would allow some outward movement of the plywood to take place, thereby creating a convex space between the plywood and the stud (i.e., an additional avenue to spread heat, flame and combustion products between the stud bays). A similar gap was observed within the wall assembly at a point having numerous attachment screws.

In spite of significant inconsistencies, the video did, demonstrate in other "test" performed, the well-documented burning properties of the thermoplastic, polyethylene. Some of the testing (those that more realistically depicted the construction of the wall assembly) showed the polyethylene began dripping, and dropping after it was ignited liquefied polyethylene to lower levels of the stud bay. This results in sustained flame impingement of the liquefied polyethylene burning, (candle wax-like) to adjacent combustible material. Surprisingly, GAI concluded that their demonstration shows that the polyethylene vapor barrier would not run and drip and would not have spread the fire from stud bay to stud bay. Nevertheless, their video in this more realistic depiction of physical conditions and wall assembly, does in deed show that the burning thermoplastic spread the fire beyond the wood stud, requiring them to douse the lingering fire. These fire spread dynamics lead to the vertical spread of the fire within the combustible concealed space and then into both the floor/ceiling assembly and the wood rafters of the Carriage House. In short, that GAI based their conclusions within their report upon

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the flawed demonstrative testing invalidates their report findings (see page 3, 3/7/06 GAI Report: "....the most compelling evidence identified during GAI's testing is once the vapor barrier burns to the studs securing it, combustion stops.")

Within the defense expert reports there is some disagreement regarding the location of the area of origin. However, it is noted that every on-scene investigator (defense or plaintiff) and the public investigators from both the town of Dedham and from the State, placed the area of origin within the kitchen of the Carriage House. In our initial origin and cause analysis report, we provide details that support of the kitchen as the room of fire origin. This rebuttal report provides additional details. The photographs taken by Mr. Marino of the Carriage House after the discovery of the fire support the determination that the fire started within the kitchen area. It is evident that the fire was in a "decay stage." The windows in the kitchen are broken, indicating that flashover had already occurred. Additionally, the sequencing of the Marino photos shows evidence of burning within the floor/ceiling assembly of the kitchen dormer area on the ground floor, adjacent recreation room, flame extension from windows and drop-down of combustibles from the second floor (etc.) into the kitchen (All of which were incorrectly interpreted by others as evidence of the growth of the fire within the kitchen). Specifically in this regard, the photographs depict the east dormer above the kitchen to contain a large volume of flames (as compared to the other two front dormers). This dormer (and the adjacent floor/ceiling assembly) had direct communication with the kitchen's combustible concealed space along its south wall. The Marino photos do not show a significant volume of fire extending from the south kitchen window to result in the amount of damage that occurred to the above roof soffit area. Finally, the roof of the Carriage House was finished with slate, which would have significantly delayed the natural ventilation of the fire through the roof thus delaying discovery and perhaps leading to the incorrect interpretation by others of fire conditions within the Carriage House based

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solely on the Marino photos as one defense expert did. In summary, the Marino photos depict fire spread consistent with that which would be expected in a concealed space fire that originated within the kitchen.

While on scene T. J. Klem and Associates also documented and traced the fire patterns within the kitchen area and identified the area of fire origin to be in the vicinity of the kitchen sink cabinet. All potential sources of ignition within this area were carefully considered. It was eventually determined through our complete investigative process that the only competent heat source within the area of origin was the plumber's torch. This complete investigative process relied upon several disciplines. The electrical wiring surrounding the area of origin was evaluated and documented on the scene by electrical engineer Donald Galler. He found and reported no abnormal electrical activity within the kitchen sink area that would be consistent with a fire cause. Mr. Galler (and others) noted the condition of circuit protection devices within electrical panels for the Carriage House and we collected the electrical circuits for further examination. Others have suggested in their reporting that the subsequent examination of retained electrical conductors, the location of the circuits and coupled with the analysis of circuit breaker operation, (i.e. the analysis technique know as arc mapping) is not consistent (nor is the lack of damage to adjacent non metallic electrical conductors consistent) with the area origin about the kitchen sink. Mr. Galler's rebuttal report concludes that this determination, based on arc mapping, is flawed and we agree for non-electrical reasons. We will repeat some of Mr. Galler's determinations from his report here and provide the factual basis for other determinations. First, we do not know if the kitchen circuits are indeed the same as the marked circuits at the electrical panels. Extensive damage and severing of these electrical circuits prevented tracing the kitchen electrical circuits back to the panels. Next, the counter top electrical circuits were protected with GFI circuit protection devices, which, Mr. Galler concludes in his rebuttal report, would negate the

validity for analysis/conclusions based on arc mapping in the kitchen. Further, because of the nature of the ignition scenario, arcing of the electrical circuits about the sink area is also a function of where and when, on the circuit, the fire assaulted them in the growth, development and spread phases. Finally, the electrical expert for the defense apparently failed to account for the gap in the south kitchen wall formed between its masonry exterior and the base wood framing (i.e., footer or shoe) in his observation of the lack of damage to an electrical circuit about the kitchen cabinet. However, detailed examination of the retained wall assembly shows not only the construction gap that the electricians used to run electrical conductors but also shows the role that the batt glass fiber insulation played. The fiberglass insulation "protected" this electrical circuit from a fire assault occurring on the other side of the insulation. Therefore, a portion of undamaged electrical insulation within the area of fire origin is not profound, no damage would be expected under these circumstances. Thus, any conclusions to refute the kitchen cabinet area as the area of origin (based on such an electrical analysis or observations regarding lack of damage to adjacent electrical conductors) are flawed. One additional defense expert overlooked the "protecting" effect that the glass fiber insulation had on some portions of the wood material within the retained wall assembly. He incorrectly interpreted such protection as evidence of the origin of the fire being elsewhere, yet they failed to account for the protection that the in-place thermal insulation would provide. Another defense expert questioned the location of the origin of the fire based on the remains of the kitchen cabinet, compared to other combustibles within the kitchen. Simply put, the "undamaged" kitchen cabined is a function of the ignition scenario and not a function of fire damage. The ignition scenario of this fire involves the polyethylene vapor barrier being ignited by the plumber's torch which resulted in the "fuse-like" movement of the burning vapor barrier away from the kitchen cabinet where more sustained and intense burning occurred. These factors and

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additional factors such as suppression of the fire, fallen debris, ventilation of the fire, etc. also account for the condition of the kitchen cabinet.

Regarding human factors, etc. effecting the ignition scenario, Mr. Kemp indicates that late in the day (i.e. Thursday, December 19, 2002, after about 3:00 pm) after setting the sink in the kitchen of the carriage house, he realized that the garbage disposal could not be installed due to the blockage caused by the location of water lines that he had installed the day before. Mr. MacLaughlin's report, our photos of the reconstructed sink and the illustrations of Mr. Drake all demonstrate that significant alterations to the existing water lines and valves would be required to install the garbage disposal. These alterations would require the use of a plumber's torch to unsolder joints as the first step in this process. Dr. Eagar's analysis of the physical evidence (i.e., cold water valve and associated testing) determined that the valve was not unsoldered during a fire assault, as others have alleged, but became unsoldered from the use of a plumber's torch. Such hot work must be done with the water to the piping turned off. Furthermore, in a recorded interview with GAI, Phil Shields, who was helping Al Kemp on Wednesday and Thursday, stated that Mr. Kemp was "soldering" under the kitchen sink on Thursday but was then corrected by Martin Sandborg who was also present during the interview. (There is no documentation that Mr. Sandborg was present on Thursday at the Carriage House at the time that unsoldering would have taken place.).Based on statements, etc. of the lack of knowledge of the necessary changes to the plumbing under the sink, statements of water running, etc. by witnesses (i.e., Mr. Sandborg, Mr. Driscoll, Mr. Shields and Mr. Kraig Magnussen), we attribute to a function of timing compared to the timing of Mr. Kemp using the torch to unsolder the cold water valve. For example, Mr. Driscoll, (contending in his deposition that he ran water in the Carriage House late in the day on Thursday), indicates that Mr. Kemp was installing the dishwasher when he was at the Carriage House late in the day on Thursday. Mr. Kemp

indicates that he discovered the blockage to the garbage disposal after installing the dishwasher.

In order to remove the cold water valve, two fittings had to be heated with a torch and pulled apart. In his deposition, Mr. Kemp describes working on his knees to solder. In this position, with the sink in place, it would have been difficult to reliably access the fittings with the torch. Of the two fittings, the union with the flexible hose was the closest in proximity to the opening in the back of the sink cabinet. Its diagonal distance from the cabinet hole was approximately 8.5". Based on the length of the flame of the plumber's torch (3 inches) and the difficulty of reaching the fitting with the sink in place, Mr. Kemp likely inadvertently ignite the polyethylene vapor barrier at the cabinet opening. Further, the logbook of Mr. Magnussen recorded that the water was turned off on Wednesday to solder stops but it does not have an entry for the water being turned back on. Mr. Magnussen stated in his deposition that he does not remember whether the water was on or off. In addition, during an initial interview with this author, Robert Cullinane stated that he "shut off gas" and "killed electric to building" (in addition to assisting the arriving fire department advance hoses and re-establishing a water supply to the apparatus) but he did not mention shutting down the domestic water as he has suggested in his deposition. The painters stated to me and to Trooper McGinn that they drew water outside of the Carriage House the day prior to the fire. The tile person indicated to me that he was using precut tiles and an adhesive/water mix that he had made up Thursday morning. Also relevant is that, in Mr. Sanborg's deposition he indicate that the plumbers, were "under pressure" from Mr. Magnussen to finish the plumbing work in the Carriage House.

Relevant facts regarding the ignition scenario are that after the fire, the cold water shut-off valve was found to be separated from the remainder of the piping. Local investigative officials and fire investigators from the Massachusetts State Fire Marshal's

Office provided photographic evidence that the cold water shut off valve under the kitchen sink was not in place during their initial documentation of the fire scene on December 20, 2002. Subsequently, we interviewed fire suppression personnel and incident command officers from the Dedham Fire Department who indicated that they did not shut off the water to the building and made no observation of water flowing from any domestic water piping. Further, the public investigators observed a fire damaged drop cloth (tarp) under the kitchen sink. During our initial investigation of the fire scene with Trooper McGinn on December 23, 2002, we noted the tarp under the sink. Neither the trooper nor I observed the valve on top of the tarp. Our initial photographs of the kitchen sink area confirm that the cold water valve was not in place and document that the separated valve was found located at the base of the sink cabinet The tarp shows no signs of "shadowing" from the valve that would occur if the valve was dislodged during the fire and came to rest on top of the tarp during the fire as alleged by others. These factors lead to our conclusions that the valve was under the tarp during the fire and that the water to the building was off. None of the defense experts offers any explanation of this evidence. Further, in support of these conclusions, Dr. Thomas Eagar determined that this valve was removed from the piping prior to the onset of the fire.

The cold water shutoff valve being out of place, the major piping reconstruction work necessary to accommodate the garbage disposal, the availability of the torch at the site, Mr. Kemp's stated soldering position and Mr. Kemp's lack of appropriate fire safety precautions during soldering operations, witness statements, etc., lead to our determination that Mr. Kemp unsoldered the piping joints and inadvertently started the fire in the wall behind the sink cabinet with his torch. There are no other ignition scenarios that support the physical evidence documented in this fire incident.

The fire patterns and damage observed at the Carriage House are consistent with a fire starting in the wall space behind the kitchen sink cabinet. The wall was

constructed of a brick facade with wall studs being placed adjacent to the brick. As mentioned earlier and as illustrated by Drake, there was a gap between the brick façade of the building and the wall studs to accommodate any unevenness with the old exterior brick south wall. Fiberglass batts of insulation were placed in the stud bays and a polyethylene vapor barrier was attached to the face of the studs. Plywood was then placed on top as the finished wall. Because of the gap between the brick and the wood studs, the wall construction mimics "balloon-type construction". Additionally, this gap is in direct communication with the kitchen ceiling joist bays and the combustible concealed space on the second floor, therefore, fire and combustion productions can travel up this space and into the knee wall, floor/ceiling and wood roof joist areas. (Yet further validity of the balloon construction analogy.) Of further relevance to the spread of fire was the 2" PVC drain pipe within the south wall assembly of the kitchen. This pipe originated in the hole of the sink cabinet and ran to the west through several stud bays before going down into the basement. It was evident from an intact stud where the pipe ran that a hole was drilled 1 5/8" from the plywood in the back of the stud to accommodate the pipe. The batt insulation would have been pushed back toward the brick wall beyond the pipe to allow for it to pass through the bay. Thus, this would result in at least a 1 5/8" gap between the batt insulation and the plywood, creating a significant air gap for fire growth and spread. Furthermore, this pipe continued to the west past the window and into at least one stud bay (46" from the hole in the cabinet) that was open to the second floor, creating the means of vertical fire spread there. This was also the area of the east dormer above the second floor and access to the floor/ceiling assembly and the roof joist of the building.

There were significant combustibles within the wall assembly and adjacent to it that would support combustion. These would include: the polyethylene vapor barrier, the plywood, wood structural members, the PVC pipe, lightweight paneling, and wood

materials. The fire patterns observed in the kitchen indicate that the fire began behind the sink cabinet in the vicinity of the hole for the PVC pipe and spread upwards and towards the west (following the air gap channel created by the pipe). After ignition, the progression of the fire within the wall took place over several hours. Because of the limited air supply within the space (and other variables), the fire was of limited growth for a substantial period of time before the intensity of the fire grew to only the flaming combustion phase. Before then however, transitions between flaming, smoldering, both phases of burning, effected the growth of the fire and so too did the volume of the concealed space, etc. Further effecting this stage of burning, was the collapse of burning materials about burned and unburned combustibles, falling embers and the resulting insulating effect of char, etc., were occurring.

Smoldering combustion is a well-documented phenomenon. It can last for hours if not days and has been witnessed with hotspots at fire scenes and flare-ups of wildfires, requiring suppression days later. Smoldering combustion is a complex phenomenon that cannot be easily quantified. It is highly dependent on the geometry of the fuel and the amount of ventilation present. The rate of burning for smoldering combustion is far less than that observed for flaming combustion. In addition, smoldering can last for an extensive period of time prior to (if ever) transitioning to flaming. For example, "A large pile of wood chips, sawdust, or coal can smolder for weeks or even months." (pg. 2-84 of the 19th Edition of Fire Protection Handbook) The burning rate of the fuel can be altered by a change in the air flow velocity. Transitions between flaming and smoldering phases of burning occurred within the combustible concealed wall assembly from the time of ignition to the discovery of the fire. As is typical of concealed space fires, within balloon, wood-frame construction, the magnitude of the fire upon discovery is severe and the fire has spread to multiple levels of the

building. Also typical in concealed space fires, the room-to-room, horizontal spread of the fire on the level of fire origin mostly occurs later in the fire incident.

The polyethylene vapor barrier also had a substantial impact on the conditions of this fire event. The ignition of the polyethylene lead to both horizontal and vertical spread of the fire from the initial stud bay of origin and then to the next stud bay until the developing fire reached the vertical, combustible concealed space which ultimately provided additional avenues of concealed fire spread/travel to the combustible floor/ceiling assembly of the kitchen, the second floor knee wall/dormer area and the combustible wood rafters/roof area of the carriage house. As the initial fire spread along the polyethylene within this large combustible concealed space, burning materials would not only extend vertically to additional combustibles above, but the burning material would also drip, run and drop on lower level combustibles within the wall assembly. In advance of the flame front, convection currents within the wall assembly likely melted large "chunks" of the polyethylene that also fell to the lower levels of the wall assembly and were ignited. The result of this phenomenon is profound on the fire growth dynamics of this incident. The precipitating liquefied, burning polyethylene drops onto horizontal surfaces within the combustible wall assembly resulting in prolonged flaming exposure to the other combustibles within the wall assembly; greater than might, at first, be expected. This phenomenon resulted in the ignition of wood construction members of the wall assembly and other adjacent lightweight combustibles.

This fire ignition scenario is not unique to the Marino fire incident. It is typical of other similar fire scenarios that I have investigated where an open flame came in contact with combustible thermal insulating materials within a combustible concealed space and burned for hours (even in occupied residence) before being discovered.

The fire ultimately spread out of the void space in the wall and into the occupied area of the kitchen. There was a ¾" gap between the back of the cabinets and the

plywood on the wall. Fire extending from the wall assembly assaulted the light weight plywood material of the cabinets and their efficient burning and spread the room fire to other combustible materials in the kitchen. Eventually the fire grew large enough in the kitchen until flashover occurred. Once the combustibles were consumed the fire began to decay in the kitchen area, at which point the fire was discovered by Mr. Marino.

As mentioned, the above described ignition scenario, is not unique to the Marino Carriage House. The National Fire Protection Association (NFPA), in the Fire Analysis and Research Division's report *Torch Fires in the United States,* indicates that there are 12,630 reported torch structure fires each year. The residential portion of these fires results in $4.5 billion in direct property damage. Another NFPA report of home fires (*The U. S. Home Product Report: Forms and Types of Material First Ignited in Fires*) cites that 12% of the 4,700 thermal or acoustical insulation fires per year involve torches. The Massachusetts Building Code, (780 CMR), and the Massachusetts Fire Prevention Code, (527 CMR) reference several NFPA codes relevant to prevent an incident such as the fire at the Carriage House. Among the NFPA standards are: NFPA 241, *Safeguarding Construction Alterations and Demolition Operations,* and NFPA 51B, *Standard for Fire Prevention during Welding Cutting and Other Hot Work.* Thus, compliance with Massachusetts law would have required a fire extinguisher to be present during hot work, using an appropriate heat shield during the hot work, and establishing a fire watch for at least 30 minutes after such hot work. The facts of this case indicate that none of these fire preventive measures was established/present during the hot work performed by Mr. Kemp.

Based on a detailed, scientifically-based examination of the fire scene that included interviews with the building owner, fire officials and key witnesses; the review of the Massachusetts State Fire Marshal's Investigative report; the initial public sector photos; review of subsequently provided witness depositions and a transcript of the

recorded statements of two key witnesses; review of laboratory testing and its subsequent expert reports of findings; review of other plaintiff's experts' reports, and the review of defense experts' reports (that also included a video of fire testing);I have come to the following conclusions regarding the fire incident at the Marino Carriage House on Friday, December 20, 2002, and I base these conclusions upon a reasonable degree of engineering/scientific certainty:

1. The water to the carriage house was off at the time of the fire. We have reviewed testimony of witnesses indicating that they believe that the water was on Thursday and that the water was turned off during the fire event. We have determined that these are moot points since the water could have been turned off late in the day after the extent of the alterations to the sink's plumbing was realized by Mr. Kemp. Laboratory analysis and testing by Dr. Eagar is consistent with this determination. Thus, no creditable physical evidence/analysis exists to support that the water was on at the time of the fire. Finally, we have not reviewed any expert's analysis explaining the presence of the tarp under the kitchen sink cabinet and the location of the cold water valve at the base of the cabinet.
2. Mr. Kemp was doing hot work late in the day on Thursday December 19, 2002, hours before the discovery of the fire. Dr. Eagar supports this conclusion. Further during a recorded interview with GAI, Mr. Kemp's helper, Mr. Shields indicates that there was soldering in the kitchen on Thursday. Mr. Sandborg, also in attendance at the recorded interview, but apparently not present at the Carriage House at the time of the soldering, who responded immediately and indicated to the GAI investigators that no soldering occurred in the kitchen on Thursday.

3. Mr. Kemp did not take sufficient safety precautions while doing hot work as prescribed by Massachusetts laws and NFPA standards.
4. ,After ignition of the easily ignitable polyethylene the fire spread within the combustible concealed space linking the first and second floors and also including the floor/ceiling assembly and wood-frame roof.
5. Combustion within the identified, large combustible concealed spaces alternated between open flaming and smoldering.
6. The fire remained in the above-cited phase of combustion until the magnitude of the fire grew and spread to multiple levels of the building.
7. During this phase of combustion and likely about an hour before the discovery of the fire (as presented in our initial report of this investigation) the fire extended into the occupied area of the kitchen. Subsequently, the fire in the kitchen reached flashover conditions, and spread to some extent to adjoining rooms and the adjoining spiral stairway.
8. The kitchen was in the decay phase of burning when the sequence of Marino photos was taken.
9. The defense's duplication of the kitchen wall assembly does not accurately replicate the key construction variables of the wall assembly significant to the continued growth, development and spread of the fire.
10. We find no creditable challenge by others to our cause determination of this fire that would warrant changes to our determinations.
11. The origin and cause of the fire at the Carriage House has been determined to have begun under the kitchen cabinet where easily ignited combustible material was located. The competent heat of ignition has been determined to be the plumber's torch in use by Mr. Kemp. Other competent sources of ignition were considered and eliminated in our investigative process.

The analysis and opinions expressed in this report are based on my knowledge of facts and information as of the date of this report. If additional data becomes available, I reserve the right to amend this report.

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